REVIEW OF EXXONMOBIL CANADA'S 2009 OFFSHORE ENVIRONMENTAL EFFECTS MONITORING REPORT

Context

DFO Maritimes Science was asked by the Oceans and Habitat Management Branch to review ExxonMobil Canada Properties Inc.'s 2009 annual report "Offshore Environmental Effects Monitoring Program ExxonMobil Canada Properties – Sable Offshore Energy Project" (Amec and Conestoga-Rovers & Associates 2010) 5 May 2010. In addition, ExxonMobil's Environmental Effects Monitoring (EEM) proposal for 2010 was provided for comment. Given the short timeline to prepare a response, DFO Maritimes Science determined that a Special Science Response Process would be used. Environmental Effects Monitoring Reports for the Sable Offshore Energy Project have been reviewed by DFO Maritimes Science in previous years (e.g., DFO 2009, 2008, 2007).

Background

The Sable Offshore Energy Project's (SOEP) EEM Program was designed to evaluate predictions made during its Environmental Assessment (EA) process. The scale and scope of this environmental effects monitoring program has been reduced over time. In 2009, the proponent monitored contaminants/tainting by examining produced water chemistry and toxicity, seabird and air quality monitoring and mussel hydrocarbon body burden. This Science Response includes the DFO Science review of monitoring results for benthic habitat and fish density, produced water chemistry and toxicity, mussel hydrocarbon body burden and sediment chemistry/toxicity. Environment Canada generally reviews monitoring results for seabirds and air quality.

Analysis and Responses

General

Despite being identified as valuable ecosystem components within the EA, most of the reporting relating to fish and shellfish concerns the monitoring of contaminants and tainting through the examination of produced water chemistry and toxicity and mussel hydrocarbon body burden. To date, there are no studies to determine if and to what extent fish health and quality is affected around the site. There is limited EEM data in the report this year in relation to the three sub-objectives of the EEM program.

Benthic Habitat and Fish Density

Benthic habitat and fish density along the pipeline and platform was evaluated using VHS video recordings and images taken during routine inspections and surveys with a remotely operated

vehicle. To ensure the results of multi-year surveys are comparable, a description of the methods used to standardized the camera survey and video analysis should be included.

As mentioned in previous reviews, it is difficult to fully evaluate the impact of production activities on benthic habitat and fish density along the pipeline given the lack of statistical design associated with this component of the EEM program. Data analysis entails a qualitative description and relative distribution of marine fauna on the pipeline. Additional numeric results, comparing species densities to baseline conditions or a reference site would be useful. In addition, some form of "BACI"-design (before-after-control-impact statistical design) may have been useful to help evaluate the success of mitigation and the validity of the environmental assessment predictions. Random visual surveys along pipelines may not be an effective sampling design to examine biological effects of industrial activity.

As mentioned in the 2009 review (DFO 2009), Table 2.2 provides counts of the number of taxa observed as a way of summarizing the information collected; however, the taxonomic groups used are too coarse to allow for any meaningful interpretation. Also, it is unclear why Cnidaria (phylum), Porifera (phylum) and Tunicata (subphylum or the phyla Chordata) have been grouped together. In the future, it would be more useful to work at the family level if the quality of the video or level of identification expertise is insufficient to allow for identification of the fauna to the species level.

Comparison between the 2008 results and results from previous years is done in a qualitative manner, with a comparison of numerical results by pipeline segment provided only for snow crab, lobster and shrimp. As the data were collected at different times of the year and from different sections of the pipeline, comparison made between years may not provide an accurate reflection of species abundance. In addition, the rationale for changing survey locations should be included.

Produced Water Chemistry and Toxicity

In 2009, produced water samples were collected from Thebaud, South Venture, Alma and Venture platforms. Acute toxicity was evaluated using three tests – a threespine stickleback test, a Microtox test, and an echinoid fertilization test. Chemical analysis was also conducted. Comments on this aspect of the EEM have been provided in previous reviews (DFO 2007; DFO 2008; DFO 2009) and many of these continue to be applicable.

As mentioned in previous reviews, the toxicity of the bioassay results is attributed to elevated concentrations of petroleum hydrocarbons even though total petroleum hydrocarbon (TPH) levels were below regulatory criteria. There has been no attempt to provide verification of this hypothesis. It is not clear whether chemical toxicity from metals, elevated ammonia concentrations, etc is contributing to the observed detrimental effects.

Considering the range of inter-annual variability within the discharge stream that may occur from the same formation, conclusions such as, "produced water from South Venture platform was found to be less toxic for Microtox and Echinoid fertilization and not significantly different in the fish bioassays in 2009 when compared with 2006 and 2007" (p. 3-15), are questioned.

The statement is made that "chemical constituents of produced water will be diluted to non-toxic levels within a few meters of the discharge" (p. vii). This will be highly dependent on produced water volume, and similar general statements about produced water have been indicated to be not supportable (i.e., in literature related to monitoring, modeling and toxicity). Literature reference should be a critical component in such EEM reports, but have not generally been

included within the SOEP EEM reports. Conclusions regarding the toxicity of produced water surrounding the platform cannot be made until the results and analysis of the dispersion study, water sampling and microbial productivity samples conducted by the Centre for Offshore Oil, Gas and Energy Research (COOGER) are presented.

Information concerning the volumes of produce water or other wastes being released is not included and should be included in future reports.

Mussel Body Burden

Comments have been provided previously by DFO Science on the mussel body burden component of the SOEP EEM program (DFO 2009; DFO 2008; DFO 2007; unpublished comments in 2005).

The proponent has suggested the possibility of enhanced mussel growth in close proximity to the rig as a result of produced water discharge; however, there has been no attempt to verify the statement. The use mussels to delineate the impact zone attributed to produced water discharge based on differences in mussel growth could be used to verify the statement.

The rate of metal and hydrocarbon accumulation vary depending on mussel age. The mussels currently collected from the legs of the platform may all be from a single year class if they are annually sloughed off due to ice or wave action and are, therefore, not representative of a natural situation. Information pertaining to the age of the mussels should be included within the report.

One of the goals of the mussel health and body burden section is to determine if sub-lethal effects occur. Testing in this report is limited to the assessment of metals, hydrocarbons and polychlorinated biphenyls in tissues. The potential sublethal impacts (e.g., growth, reproduction, etc) of produced water on mussels have not been examined. A caged bivalve study on a grid from the platform would provide useful information on both short and long term effects as well as sublethal effects. The literature indicates that cages would have to be placed at varying distances in different directions as well as at different depths in the water column to be effective. However, any caging of bivalves would not serve as a substitute for monitoring pertaining to fish health and fish quality.

Proposed 2010 EEM Plan

The level of detail provided in the proposed 2010 EEM Plan is insufficient to determine the likelihood of achieving monitoring objectives. While it is assumed that protocols used would be similar to those used in 2009, the sampling methodology and analysis to be used is not described nor is it clear how comparisons with previous results would be made. It is unclear what the proposed estimates of average fish densities of commercial fish species would be compared against (i.e., to a reference site, past results, or future sampling).

Analysis of mussel body burden is proposed around the Thebaud platform, which is to be conducted in a manner consistent with the 2009 program. Comments provided previously would apply.

Conclusions

SOEP's 2009 EEM report is consistent with previous reports. While monitoring of benthic habitat and fish density was conducted this year, the methods used were such that the results are not considered to be particularly conclusive.

It is unfortunate that the SOEP EEM does not address fish health and fish quality (tainting) issues. A preliminary study at the Thebaud site did note mixed function oxidase (MFO) induction in codfish. Chronic MFO induction has been associated with a variety of sublethal effects in adult fish as well as lethal effects in fish larvae. In similar monitoring programs from other areas (Grand Banks, Europe) biomarkers are seen as an important tool in proving or disproving whether oil development is having an effect on fish. The monitoring approach used in the SOEP EEM program has not allowed for this type of analysis. It is hoped that improvements can be made in this area for 2010.

SOEP's 2009 EEM report contains little contextual literature and this should be addressed in future reports.

Finally, as recommended in previous years, it is suggested that SOEP develop a reporting format for the EEM results that would allow routine comparisons across years for monitoring components that are collected annually.

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Sources of Information

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